

Quarterly Report
Covering April 1, 2005 to June 30, 2005
Submitted June 30, 2005

Project Title

Warm Water Species Fish Passage in Eastern Montana Culverts

Prepared By

Dr. Joel Cahoon, P.E., Ph.D.
Civil Engineering Department, 220 Cobleigh Hall, Montana State University
Bozeman, MT 59715 (406) 994-5961 joelc@ce.montana.edu

Principal Investigators

Dr. Joel Cahoon, P.E., Ph.D.
Civil Engineering Department

Dr. Thomas McMahon, Ph.D.
Fish and Wildlife Science

Otto Stein, Ph.D.
Civil Engineering Department

Jarrett Barber
Math and Statistics

Research Assistants

Leo Rosenthal, Fish and Wildlife Science Stephen Searles, Undergraduate

Introduction

This progress report covers work completed between April 1, 2005 and June 30, 2005. Work on the project during this period has been primarily devoted to final designation of field sites and testing of various field methods at those sites.

Project Objective

Culverts are a common and often the most cost effective means of providing transportation intersections with naturally occurring streams or rivers. Fish passage and fish habitat considerations are now typical components of the planning and design of waterway crossings. Many culverts in Montana span streams that support diverse fisheries. The health of these fisheries is an essential element of a recreational industry that draws hundreds of thousands of visitors to Montana annually. Additionally, there is growing recognition of the value of native Montana species, some of which are considered 'species of special concern' in the state. In recent years these concerns have become apparent for warm water species in low gradient, high sediment bearing, intermittently flowing streams that are typical of eastern Montana.

Transportation system planners, designers and managers recognize that fish passage through Montana's culverts is a concern. However, there is much contention concerning the impact that a culvert can have on a fishery. Recent basin-wide studies of various trout species that we conducted in western Montana indicate that the tools that some planners and designers promote for forecasting fish passage concerns may be overly conservative. Which species, life stages, and how many individuals must have fish passage access for how long, are questions that are often brought forward during discussions on the design and retrofitting of culverts to accommodate fish passage concerns. ***The problem is that for warm water fish species and settings in eastern Montana, the timing and number of fish that must pass a culvert to maintain viable species diversity in the watershed is unknown, and the physiologic abilities of these species relative to such common fish passage questions are often unknown.***

Progress

Site Selection

Final site selection is now complete. Sites were selected based on the following criteria from a group of candidates recommended by project staff and MDT and other agency personnel. The streams selected had the following characteristics:

- flowing water at least part of the year,
- more than one culvert crossing,
- are known to have warm water fish populations, and
- are close enough in proximity to effectively sample throughout the season.

So, the streams selected were Sand Creek, Clear Creek and Beaver Creek - all streams in the Glendive, Montana area. Examples of culverts on each of these streams are shown in Figure 1.

Field Work

The physical conditions of the streams in Eastern Montana are different enough from the settings of most fish passage studies that we have spent considerable effort determining the most appropriate methods. It appears that the approach we will use is a mark-recapture direct-passage assessment with an experimental design similar to the Seeley basin study (Cahoon et al., 2005). Differences from the Seeley design are that in this study the marked fish will be seine netted (an example of collection with seine nets is shown in Figure 2) rather than electroshocked, marking will consist of VIE tags (fluorescent colored implants - shown in Figure 3) rather than fin clipping, recapture will be with seine nets rather than fixed traps, and turbidity will be an important observation to add to the hydraulic data set.

Another important component of the study is the collection of hydraulic data to overlay on the fish passage information. Four automated stage and temperature recorders have been deployed. Each recorder logs water depth, water temperature and air temperature

on 15 minute intervals. Velocimeter data has also been recorded to develop a flow-discharge curve for each stage recorder. The flow data has been recorded at a variety of medium to high flow rates, and several low-flow observations will be added to provide robust stage discharge curve for each site. Each culvert will be surveyed and spot checks of water depth and velocity measurements are ongoing.



Figure 1. Examples of culverts on (clockwise from top left) Beaver Creek, Clear Creek and Sand Creek.



Figure 2. Collecting fish using seine nets.

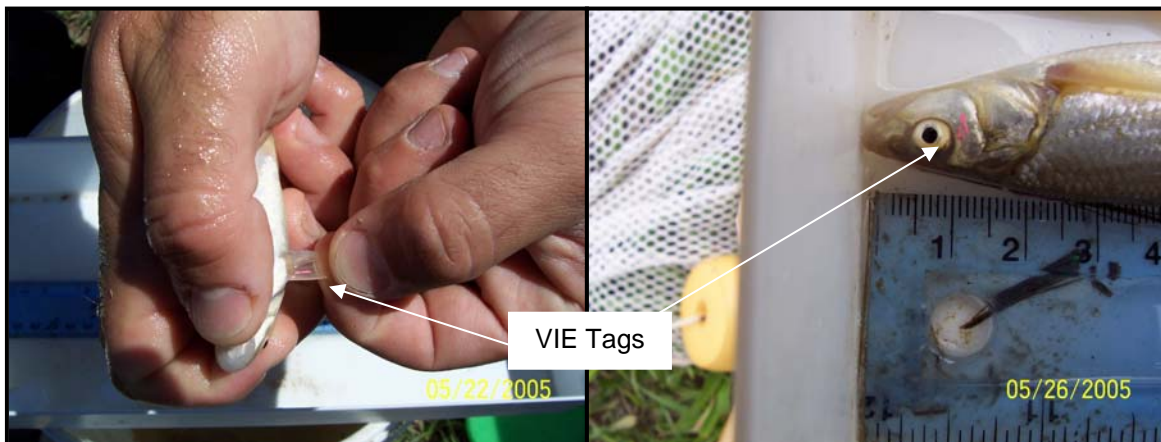
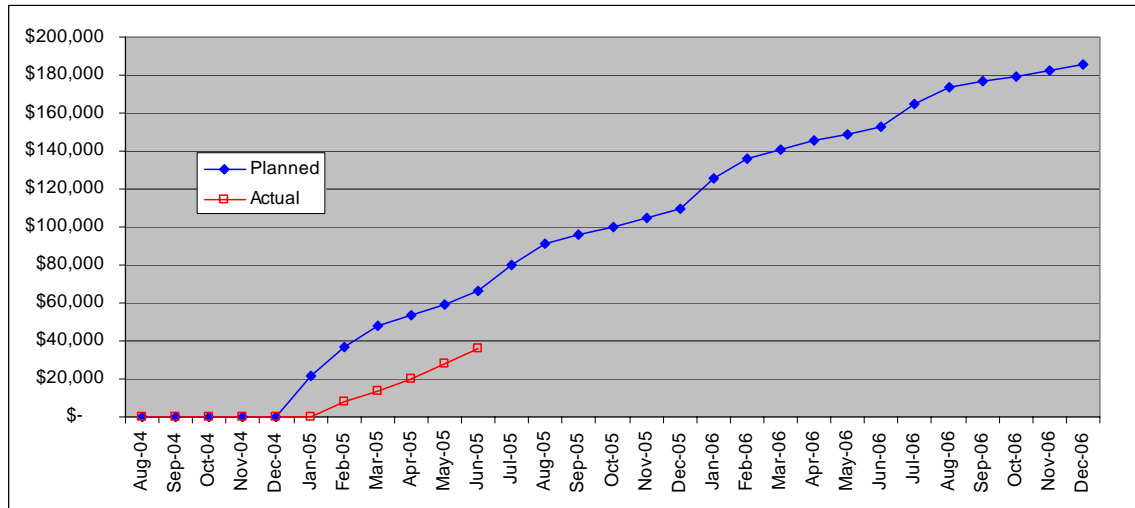


Figure 3. Two fish having VIE tags inserted in different body locations.

Budget

Actual expenditures are coming in line with planned expenditures because of some field equipment and supplies purchases and the onset of travel to and from the research site. Expenditures still include graduate student stipends and tuition expenses.



References

Cahoon, J. E., T, McMahon, O. Stein, D. Burford and M. Blank. 2005. Fish passage at road crossings in a Montana watershed. FHWA/MT-05-002/8160.